ABSTRACT

[0076] Transgenes driven by naturally occurring cardiac promoters have relatively low levels of cardiac transgenic gene expression, and have consequently limited the use of cardiac muscle as a target for plasmid mediated gene supplementation. However, by randomly assembling motifs of E-box, MEF-2, TEF-1 and SRE elements, cardiac-specific synthetic promoter recombinant libraries have been produced. By screening hundreds of resultant clones for transcriptional activity both *in vitro* and *in vivo*, a few cardiac-specific synthetic promoters were discovered comprising a transcriptional potency that greatly exceeds the transcriptional levels obtained from natural myogenic and viral gene promoters. These promoters are used to direct the expression of desirable genes in nucleic acid expression constructs specifically to cardiac cells. Thus, these cardiac specific-synthetic promoters can be utilized for plasmid mediated gene supplementation for serious health conditions, such as ischemic disease, myocardial infarction or heart failure. Thus, one aspect of the current invention is a cardiac specific-synthetic promoter produced by a method that generates a library of randomized synthetic-promoter-recombinant expression constructs. Another aspect of the present invention is directed to a method using the cardiac specific-synthetic expression construct for expression a gene of interest in a cardiac cell.